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The Nature of Research

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There is more than one way of defining research, and there are several traditions as to how research should be carried out. I will try to describe the nature of research in terms that would be common to most of them.

First, very briefly, I will define research in its most general sense. Then I will talk about research according to the Science tradition. Third, I will say something about research in the Humanities tradition. Finally, I will talk about research through Practitioner Action.

research in general

Research is systematic enquiry whose goal is communicable knowledge:

- systematic because it is pursued according to some plan;
- an enquiry because it seeks to find answers to questions;
- goal-directed because the objects of the enquiry are posed by the task description;
- knowledge-directed because the findings of the enquiry must go beyond providing mere information; and
- communicable because the findings must be intelligible to, and located within some framework of understanding for, an appropriate audience.

research in the science tradition

In the Science tradition, several distinctive categories of research activity are recognised, the categories being distinguished by their intentionality. Widely accepted categories are:

- (i) Fundamental Research: Systematic enquiry directed towards the acquisition of new knowledge, without any particular useful application in view.
- (ii) Strategic Research: Systematic enquiry calculated to fill gaps in Fundamental Research and/or to narrow the gap between Fundamental Research and possible useful applications.
- (iii) Applied Research: Systematic enquiry directed towards the acquisition, conversion or extension of knowledge for use in particular applications.
- (iv) Action Research: Systematic investigation through practical action calculated to devise or test new information, ideas, forms or procedures and to produce communicable knowledge.

- (v) Option Research: Systematic enquiry directed towards the acquisition of information calculated to provide grounds for decision or action.

The greatest volume of research in the Science tradition is categorisable as Applied Research.

Applied Research may or may not result in inventions and discoveries of any significance, and its findings may or may not be widely generalisable. Indeed, Applied Research can often produce indeterminate or even completely empty results. Empty results are not

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necessarily valueless. In fact it may be very useful indeed to a manufacturer or a government department to know that a particular line of proposed development would be fruitless for themselves and/or for their competitors.

Action Research is often conducted by practitioners of one or other of the useful arts, such as medicine, teaching or business, or, indeed, of any of the other disciplines embraced by design education, rather than by professional researchers. Here, I shall be using the term 'practitioner' to cover all or any of these. I shall be having a lot more to say about practitioner research and Action Research later on.

Option Research is more limited in scope, being pursued only to the point where sufficient information has been produced to enable the manager or policymaker who commissioned it to take a decision on the given issue. Most Option Research is highly situation-specific, that is, valid only in the circumstances of the situation enquired into. Conducted properly it is nevertheless a systematic enquiry whose goal is knowledge. Much market and business research falls into this category. Very little Option Research is ever published, however. Consequently, it is regarded with the greatest suspicion by orthodox scientists. It is widely regarded as ineligible for the title 'research', and is rarely recognised as suitable for registration for a research degree.

Science is concerned with explanation. What can be observed? What events can be recorded? How does this, that or the other event proceed? What is the cause of this or that? The scientific ideal, not always achieved, is to produce explanations that have enduring validity. Most particularly, the scientific ideal is to produce explanations that remain valid when tested in wider and wider fields of application, and which therefore offer some powers of prediction.

Science has many branches, from anthropology to

astrophysics. However, Science is not defined by its subject matter. Science is defined by its intellectual approach. The range of subjects that have been addressed by Science, and which have ceased to be preserve of myth, fable and metaphysics, has continued to expand throughout the history of mankind's endeavours. Scientists have the right to turn their minds to anything, as long as they do it scientifically.

But what do we mean by 'doing it scientifically'? The traditional Western perception of a correct scientific approach, still held by many to the present day, is based on ground rules that were first systematically set out by Francis Bacon in 1620. The whole process is characterised as being *empirical* (that is, based upon evidence obtained in the real world), *objective* (that is, free from the influence of value judgements on the part of the observer), and *inductive* (that is, moving from the observation of specific instances to the formulation of general laws). Intellectual processes of any sort that fail the tests of empiricism, objectivity and inductive reasoning are dismissed as unscientific and unreliable. So goes the Baconian paradigm.

However, amongst philosophers of science, and amongst scientists working at the more advanced levels of scientific endeavour, the last three decades have seen a complete overturning of the Baconian paradigm for the conduct of scientific enquiry. Chief amongst the revolutionaries has been Karl Popper, mathematician and philosopher, who is living today. His not very numerous, but highly influential, works on the philosophy of science have been published in English at intervals since 1959 (his earliest works, from 1934, were written in German). They have had a profound effect that reaches far beyond the bounds of conventional science. In them, he has rejected the whole traditional Baconian view of scientific method, and replaced it with another. His argument begins by pointing out the logical asymmetry between verification and falsification. His own well-known example runs like this:

No number of observations of white swans allows us logically to derive the universal statement: 'All swans are white'. Searching for, and finding, more and more white swans does not prove the universality of the white swan theory. However, one single observation of a black swan allows us logically to derive the statement 'not all swans are white'. In this important logical sense, generalisations, although never verifiable, are nevertheless falsifiable. The pursuit of verification can go on forever, but falsification is instantaneous. This means that whilst most scientific theories are unprovable, they are still testable, indeed, the only reliable way to test a scientific proposition is to formulate it in as unambiguous a way as possible, and then to conduct systematic attempts to refute it.

It is this last statement which lies at the heart of the Popperian revolution. Falsification of theory, not verification, should be the aim of scientific enquiry.

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Also central to the Popperian view is the acknowledgement that new scientific propositions may properly be, and mostly are, the result of inspired guesswork rather than the product of inductive reasoning. By the same token, empiricism is more important in the stages when a theory is under test than

in the stages when it is being formulated. The title of Popper's most influential book, first published in 1963, but revised several times since, is *Conjectures and refutations*. This title encapsulates the Popperian view of the correct scientific approach. Empiricism, objectivity and induction have their place, but this is after the formulation of an explanatory conjecture, not before it.

So how can we summarise the philosophy behind the modern approach to scientific research? The post-Popperian approach demands that the investigator:

- be liberal about the sources of conjecture and hypothesis at the commencement of research; and
- be sceptical in the handling of data and argument during research; and
- be astringent in testing findings and explanations on the completion of research.

research in the humanities tradition

In most English speaking countries, and certainly in Britain, the term *The Humanities* and the term *The Arts* tend to be a little bit confused, and are used almost interchangeably. Either term can be used to refer to that large group of academic disciplines in which mankind is the central concern, in contrast with *The Sciences*, in which the physical world is the central concern. I tend to employ the expression *The Humanities* as the umbrella term, and divided the disciplines within it into two subgroups: *Metaphysics*, comprising theology, philosophy, epistemology, ethics, aesthetics, etc; and *The Arts*, comprising language, literature, drama, history, architecture, art, music, etc.

With reference to *The Arts*, I want to make a distinction between:

- the practice of the Arts, such as creating new works of literature, drama, music, etc, or performing existing works of drama, music, etc;
- scholarship in the Arts, such as knowing the content, authorship, history and categorisation of works in the Arts; and
- research into, or for the purposes of, Arts activity.

This section of my talk is concerned with academic attainment in Arts disciplines, and particularly with the award of research degrees in the Arts.

The disciplines of the Arts are variously concerned with:

- expression in appropriate media;
- creative reflection on human experience;
- the qualitative interpretation of meaning in human expression;
- judgements of worth;
- the exploration of truth values in text;
- the categorisation of ideas, people, things and events;
- the tracing of, and commentary upon, the provenance of ideas, people, things and events.

Some, but not all, Arts activities are based on empirical evidence in the real world. Some, but not all, Arts activity cites exemplars in the real world or in previous writings in support of argument leading to a postulated conclusion. Nevertheless, virtually all Arts activity is essentially subjective in character.

Scholarship in the Arts makes an important distinction between primary sources of information, and secondary sources of information. Primary sources include: originals, or original records of, or contemporaneous commentary upon, ideas, things, events or persons. Secondary sources include other persons' commentaries upon primary material. Acknowledged scholars in the Arts are expected to have a comprehensive knowledge of the primary sources in their field. They are expected to have a clear vision of the provenance of the important ideas, things and events. They are expected to offer critical appraisal of the more significant secondary source material. It is not necessary, however, for a scholar to have produced new primary material in order to be recognised as an authority in a given field.

In view of the subjective nature of Arts activity, any witness of a particular Arts work needs to know from which standpoint the author produced it. A popular challenge put to an author of either primary or secondary material by a witness on first confrontation with a work is: "What is your theoretical position?" This is an important question. The author's ideology and framework of values will have coloured his or her view of events, and will be embodied in his or her expression of them. Unless the witness shares the author's position, or at least recognises what that position is, he or she will not be able fully to understand the work or to judge it.

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The use of the term 'ideology' in this context needs a bit of explanation. A formal definition of the term 'ideology' is:

An overarching system of explanation or interpretive scheme that serves to make the world more intelligible to those who subscribe to it.

Thus, the possession of an ideology enables a person of a community to make coherent sense of otherwise disconnected theories and experiences and values arising in different aspects of life. A political ideology can do this. So can a religious ideology. So can an aesthetic or a scientific ideology. Witnesses may or may not share a particular author's ideology in their hearts when confronted by an Arts work, but if they know what the author's position is, they can at least appreciate what the author was expressing. By the same token, it is the duty of a scholar in the Arts to make clear the standpoint from which he or she may be offering opinion or discoursing upon the content, value and authorship of primary and secondary source material.

Master's degrees and Doctoral degrees, not being research degrees, may be awarded for the attainment of scholarship in the Arts.

The conduct of research in Humanities disciplines goes beyond scholarship. Scholarship is essentially comprehensive knowledge of a particular field in a particular discipline. Research in that discipline consists in finding new things to know, or in identifying new ways

of knowing them, or in refuting previous commentary on existing material. In recent times, the once unbridgeable differences between Science research and Humanities research have moved closer together. Whilst Science still seeks ultimately to explain and Humanities still seek ultimately to evaluate, Science has become less reductionist in its attitudes and the Humanities more empirical. Moreover, their mutual use of databases and information technology has brought their methodologies closer together.

There was a time when in some Arts disciplines it was only necessary to uncover some hitherto unknown or unrecognised or unorganised material (say a complete set of the laundry lists of some dead poet) and to catalogue this material in order to earn a research degree. There are few areas where such a condition could apply today. Generally, research in the Humanities tradition advances by the conduct of logical argument. Propositions are validated or refuted by exemplification and citation.

It is in the nature of the Humanities disciplines that their judgements are made within a framework of values. There is no such thing as 'objective' Humanities research. That is why it is so-important for the investigator to declare his or her 'theoretical position'. Nevertheless, some Humanities research strives to present findings generalisable within a given context. In such a case, it is up to the reader to determine whether or not the argument and the findings remain valid in that or a different context.

All the Humanities disciplines have well established rubrics for sound scholarly argument and good research practices. Common amongst them are requirements to distinguish between evidence produced by the research, evidence imported at secondhand, the judgements of others, and judgements by the investigator. Scholars are expected always to be alert to the pitfalls of circular argument, that is, where the author is seen to be saying that A is greater than B, while B is greater than C, and C is greater than A. Harder to spot, in a long and complex argument but equally condemned, are commutative arguments, that is, where A is said to be greater than B because B is less than A. Good practice in Humanities disciplines demands that all citations shall be checked at primary source level, and that all sources shall be acknowledged.

The principal purpose of pursuing an MPhil or MRes degree programme in the Arts, as in the Sciences, is to learn the methods of research appropriate to a given field of enquiry; to advance knowledge in a given discipline; and to qualify for admission to a PhD degree programme. The distinguishing features of an MPhil or MRes programme are:

- the critical appraisal by the candidate of prior research; and
- close attention to the principles and practice of research methodology; and
- the conduct under supervision of a single major task of systematic investigation

MPhil and MRes programmes have, or should have, a substantial 'taught' element.

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Where a PhD degree programme is offered, its distinguishing features will be

- (i) the critical appraisal by the candidate of prior research; and
- (ii) close attention to the principles and practice of research methodology; and
- (iii) the conduct of a single major systematic investigation; and
- (iv) the delivery of a substantial contribution to knowledge.

It is a telling mark of the trend in academic thinking in recent years that good practice in academic research in the Arts can be expressed in much the same terms as the post-Popperian paradigm adopted in Science research:

- The enquiry must be calculated to expose new observations or new explanations; or it must seek to falsify previous observations or explanations; and
- the theoretical position from which the investigation is approached must be made clear; and
- the chief questions to be addressed by the enquiry must be unambiguously expressed. It is not necessary to show that the problem posed, or the conjectures employed, arise from empirical data, nor that they have been arrived at by inductive reasoning; but
- primary sources must be cited for evidence employed, and where secondary sources are referred to, the provenance of the ideas handled must be indicated; and
- any new data obtained must be recorded so as to be checkable by later observers, and all the procedures and argument employed must be transparent to later observers; and
- all initial and intermediate conjectures must be configured so as to lend themselves to attempts at refutation during the course of the study, and all ultimate findings and conjectures must lend themselves to attempts at refutation by subsequent investigators; and
- the record of the investigation and its findings must be published or otherwise exposed to critical appraisal by other investigators.

research through practitioner action

Some artists and designers, and some other creative practitioners, claim that what they ordinarily do is research. They argue that their art works or design products or other creative practitioner output constitutes new knowledge. Moreover, they claim that the act of publicly exhibiting, installing, manufacturing or distributing their works, constitutes publication. Therefore, they say, creative practitioner activity is synonymous with research activity. To what extent can such a claim be justified?

Undoubtedly, there is such a thing as tacit knowledge, that is, a kind of knowing that is not separated, or separable, from the perception, judgement or skill which the knowledge informs. There will be some of that in all

creative practitioner activity. Undoubtedly some knowledge can be transmitted by some works to other practitioners, and possibly to the population in general, when the work is 'published'. Undoubtedly, in some, circumstances, a striking art work or a radically new product or other innovation can itself constitute new knowledge, tacit or otherwise, that can be highly significant leading to major changes in people's perceptions, circumstances and values. Clearly, too, a great deal of practitioner activity entails some research, of orthodox or unorthodox kinds, in support of the main thrust of the practitionership. It is not quite so certain, however, that the practitioner activity itself is quite the same as research activity, however much research it may have been supported by.

One has to ask, was the practitioner activity an enquiry whose goal was knowledge? Was it systematically conducted? Were the data explicit? Was the record of the conduct of the activity 'transparent', in the sense that a later investigator could uncover the same information, replicate the procedures adopted, rehearse the argument conducted, and come to the same conclusions? Were the data and the outcome validated in appropriate ways?

Most academic institutions can point to at least a few cases of practitioner activity where an effort has been made, successfully, to meet these criteria. So can a few studios, research institutes and professional consultancy offices. In these cases practitioner activity can properly be equated with research, and should be recognised and rewarded accordingly. Where, however, any activity, whether it claims to be 'research' or not, fails to meet the criteria which define research activity as 'a systematic enquiry whose goal is communicable knowledge', it cannot properly be classed as research or equivalent to research.

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However, identity between practitioner activity and research activity is not the only possible relationship. There are other relationships that are worth exploring. It can be useful to distinguish between research about practice; research for the purposes of practice; and research through practice.

Research about practice can be of many kinds. Art or design history, for example, and the analysis and criticism of the output of art or design activity, are orthodox Humanities subjects. Studies about art or design in relation to people and society fall within the Social Sciences. Studies about the materials and the processes which are or could be used in, or specified by various kinds of art or design activity fall within appropriate Science disciplines. Studies of the methodologies of art or design fall within the cross-cutting discipline of design research, which embodies several kinds of research. All studies about practice, if they are to be recognised as research studies, must employ the methods, and accord with the principles, of the class to which they happen to belong.

Similarly, research activity conducted for the purposes of contributing to other practitioner activities can also fall into any category of Science or Humanities, and must be practised according to the principles underlying that category. Where an investigation for the purposes of contributing to a practitioner activity is conducted according to the principles of its field, and is indeed a systematic enquiry whose goal is communicable knowledge, then the investigation can properly be

called research. However, the fact that research 'for the purposes of' has underpinned a particular practitioner activity does not permit the practitioner activity itself to be described as research.

It is when research activity is carried out through the medium of practitioner activity that the case becomes interesting. There are circumstances where the best or only way to shed light on a proposition, a principle, a material, a process or a function is to attempt to construct something, or to enact something, calculated to explore, embody or test it. Such circumstances occur frequently in explorations in, for example, agriculture, education, engineering, medicine and business. Such explorations are called Action Research, which I defined earlier as 'systematic enquiry conducted through the medium of practical action; calculated to devise or test new, or newly imported, information, ideas, forms or procedures and generate communicable knowledge'. The principles for the proper conduct of Action Research are well established in agricultural research, educational research, medical research, etc; as well as in all or most of the disciplines of, for example, this Environment School.

All the normal rules governing research practice apply to Action Research. It must be knowledge directed, it must be calculated to produce new knowledge, or be intended to test, and maybe refute, existing knowledge. It must be systematically conducted. The chief questions to be addressed by the research must be unambiguously expressed. The methods of enquiry and analysis must be transparent. The data employed, and the observations made, must be fully and honestly recorded. And the whole must be published or otherwise exposed to critical examination by others. However, in one important respect Action Research is different from the other categories of research activity. Most Science research, at any rate, is planned and conducted in such a way as not to allow the enquiry processes to contaminate the phenomenon under investigation. The investigator tries not to interfere with the situation, or to influence the forces at work within it. He or she tries to ensure that personal values and expectations do not affect either observations or conclusions. In Action Research, however, the investigator is explicitly taking action in and on the real world in order to devise or test or shed light upon something. Sometimes, notably in educational research and medical research, the investigator is a significant actor in the human situation in which the action intervenes. In such circumstances, it is impossible to conduct the investigation on an interference-free and value-free and nonjudgmental basis. Consequentially, it is essential good practice for the Action Research investigator to make clear precisely what the intervention was, and exactly what was the theoretical, ideological and ethical position the investigator took up in making the intervention, observations and judgements. We have come across this consideration before, in connection with the subjective character of Humanities research, but it applies in Action Research even where the research methods employed are in other respects planned and exercised within the Science tradition.

Thus an important reservation has to be applied to research through practitioner action, as to all Action Research. It can hardly ever be objective, in the strict sense of the word. Moreover, Action Research is almost always 'situation-specific'. The term 'situation-

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specific' reminds us that, because Action Research is pursued through action in and on the real world, in all its complexity, its findings only reliably apply to the place, time, persons and circumstances in which that action took place. It is thus difficult and dangerous to generalise from action research findings. That is why orthodox scientists, in particular, are so suspicious of it. The Action Research investigator therefore has to keep it clear in his or her own mind that the investigation is necessarily situation-specific, and usually non-objective. He or she has to make it clear that the findings will only be generalisable to a very limited degree. Even so, Action Research findings are extremely valuable. They produce insights which might otherwise never be obtained. For a century or more they have provided case account material that has been extremely fruitful in the advancement of, for example, medical practice, agriculture, environmental studies and law. They have provided hypotheses for later testing in more generalisable Applied Research or Strategic Research programmes. Thus research through practitioner action, despite its being highly situation-specific, can advance practice and can provide material for the conduct of later, more generalisable, studies, provided the research is methodologically sound, the qualifications are clearly stated and the record is complete.

An investigator wishing to publish Action Research case study material often encounters problems of ethics, notably where individual people were part of the situation intervened in.

He or she may encounter conditions of commercial confidentiality, where industrial firms are concerned. In these circumstances, the investigator may have to find ways of publishing the research results for the benefit of other practitioners without revealing names, or other sensitive data. Professional scholars and researchers would probably still protest that such results were incapable of being verified, replicated or tested by others, and were therefore not recognisable in academic circles as a true contributions to knowledge.

Clearly, no matter whether a piece of research is about practice, or is conducted for the purposes of practitioner activity, or is conducted through practitioner activity, its status is determined by the conventions and standards of the class of research to which its procedures belong. Its reliability is determined by its methodology. In the case of research for the purposes of a practitioner activity, however, there may be circumstances where it does not matter whether the research was well done or badly done, or whether the research results turned out to be true or false, or whether the findings were situation-specific or generalisable. It may be sufficient to demonstrate that the practitioner outcome itself is satisfactory. In such a case, professional scholars and researchers would almost certainly protest that the investigation was, at best, Option Research, and at worst, not research at all, but mere speculation or exploration. The validation of the outcome of the practitioner work itself is another matter, of course, properly dealt with by field testing, or whatever.

To return to our intermediate question, it becomes clear that for academic recognition purposes a practitioner activity can rarely be recognised as in itself a research activity. One has to ask: Was the activity directed towards the acquisition of knowledge?

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Was it systematically conducted? Were the findings explicit? Was the record of the activity 'transparent', in the sense that a later investigator could uncover the same information, replicate the procedures adopted, rehearse the argument conducted, and come to the same (or sufficiently similar) conclusions. Were the data employed, and the outcome arrived at, validated in appropriate ways? Were the findings knowledge, rather than information? Was the knowledge transmissible to others? Only when the answers to all these questions are in the affirmative can a practitioner activity be classed as research.

rewarded, awarded or assessed?

Let me summarise my argument. We have seen that not all research, however sound, qualifies the researcher for the award of an academic degree. There are many other kinds of reward for successful pieces of research: fees, patents, profit sharing, publication, fame. Those who share in, or promote, these rewards are all much more concerned with the outcome of the research than with the research methodology. A researcher might, indeed, enjoy great profit from a research exercise that was, in fact, quite ineptly conducted, but had by chance achieved a demonstrably useful result.

I argued that practitioner activity can count as research if, and only if, it accords with the criteria of research. It must be knowledge directed, systematically conducted, unambiguously expressed. Its data and methods must be transparent and its knowledge outcome transmissible. But like all Action Research, research through practitioner action must be recognised as very probably non-objective and almost certainly situation-specific.

A research degree on the other hand, is primarily an acknowledgment of the competence of the person who conducted the research. For this reason, an examiner of a submission for a research degree is concerned much more with the soundness of the methodology than with the usefulness of the findings. Even a negative or empty result from research might still be rewarded with an academic degree if the methodology had been impeccable. This is because the identification of an empty field, or the refutation of an hypothesis, can nevertheless be a significant contribution to knowledge, and can demonstrate a satisfactory standard of research competence. Clearly, in every case of research conducted for the purpose of submitting for an academic degree, it is the quality of the research methodology that will be of paramount importance to the Examiners. Degree-worthiness is not quite the same as result-worthiness.

All this has been well understood for a long time.

What is new, perhaps, today, is the introduction of a new quality to be sought for in research: the elusive quality of Research Assessment Exercise-worthiness.

(This section was included as a separate section of text on page 13. It included three images (one on page 13) which were not legible on the scanned photocopy available for transcription)

examples of action research

Action Research is being carried out by Professor Philip Roberts and his colleagues at the Department of Design and Technology of Loughborough University of Technology. Amongst the projects which have been undertaken is an environmental project which focuses on a Leicestershire village (see Figures 01 and 02). The work was conducted by a group of fourteen year old children who looked into the environmental issues in their village. The work resulted in new play facilities being provided. Another project carried out by twelve year old children at a Leicestershire school involved a piece of graphically recorded data. Movements around a kitchen (see Figure 03) were recorded with a view to the possibility of its better arrangement.

About this transcribed paper

I made this copy, having made several attempts to obtain a good quality image of the paper. Several people had old photocopies of the work which they sent me following a request for help to members of the JISCmail PhD-Design discussion list and I am grateful for their help.

Codesign was a short-lived but very influential journal published in the mid 1990s at a time when design research was just beginning to expand from a relatively small-scale activity to being part of the work of a large number of universities and colleges.

*I believe that this paper is very important partly because it is the first organized attempt to set out the terms of engagement for practice-led research in design. Archer sets out the three-part scheme of research **about** practice, research **for** the **purposes** of practice and research **through** practice.*

This idea has often been attributed to Christopher Frayling who published it before Archer in a well-known Royal College of Art Working Paper "Research in Art and Design" (1993). However Norman, Heath and Pedgley (undated) state that Archer claimed, in 1999, to have "coined the phrase" in the 1970s. Archer was a very well-known design researcher at the Royal College of Art before and during Frayling's term as Rector of the RCA.

Norman, E. Heath, R. Pedgley, O. (undated) *The framing of a practice-based PhD in design* Core77 Research Web Pages (available online at <http://www.core77.com/research/thesisresearch.html> accessed January 2009)

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